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HOLLOW BODY PRODUCED FROM A FLAT TEXTILE PRODUCT, ESPECIALLY FOR EQUIPPING MOTOR VEHICLES

The invention pertains to a molded article of the type indicated in the introductory clause of Claim 1. The flat textile products used for this purpose consist of nonwoven material or needled felt. The molded articles are produced in a press, consisting of an upper and a lower die. The flat textile product is laid between the two dies, and these are then brought together. The flat textile product is treated with a binder, which binds the textile fibers together. For this purpose, the press is heated or cooled as required. After the pressing step, the molded article retains the shape impressed upon it by the dies.

Such molded articles are used to fit out motor vehicles. The production of shell-shaped molded articles of considerable depth is difficult and expensive in terms of material. For example, the depth of the shell-shaped product has been limited in the past by the deep-drawability of the flat textile product.

The flat product will tear if the deformation exceeds a certain depth. A large amount of material must be used, because, when the article to be press-molded is very deep, the flat product must have a high input weight. This is why the known molded articles with deep shells have always had a relatively high unit weight.

The invention is based on the task of developing a satisfactory molded article of the shell type as indicated in the introductory clause of Claim 1, which, even though of considerable depth, is characterized by a surprisingly low input weight, while the desired minimum wall thickness is also maintained. This is achieved by means of the measures indicated in the characterizing clause of Claim 1, to which the following special meaning attaches.

The invention uses two parting lines to divide the molded article into at least two molded segments; the molded segments are connected to each other by a linear bending line in the flat textile product. This bending line functions as a fold axis, around which the molded segments can move with respect to each other between a folded-out position and folded-in position. It is thus the width of one of the molded segments which then determines the depth to which the flat textile product is molded

in the press dies, and this width is much smaller than the shell depth of the finished molded article. The finished deep-shell molded article is not obtained until after the molded segments have been folded together. Then the two parting lines come into contact with each other. The depth of the shell is no longer determined by the depth to which the flat textile product can be molded and can thus be as deep as desired. The bottom of the shell and the side walls can take any desired form. All this is possible, because the shell depth of the finished molded article no longer determines the direction in which the flat textile product must be drawn. The flat product can be deep-drawn either diagonally or transversely woth respect to the course of the joints. With respect to the finished product, the flat product is therefore deep-drawn in a completely different direction, that is, in a much more favorable one: the cross section of one of the molded segments determines the molded depth.

Additional measures and advantages of the invention can be derived from the subclaims, from the following description, and from the drawings. The drawings illustrate the invention on the basis of several exemplary embodiments:

-- Figure 1 shows a schematic, longitudinal cross section

through a part of a vehicle body, in which a molded article according to the invention has been inserted;

-- Figure 2 shows a side view of the molded article used in Figure 1 before it has been installed in the vehicle body;

-- Figure 3 shows a cross section through the molded article of Figure 2 along line III-III in that figure;

-- Figure 3a shows an enlarged view of the detail marked IIIa in Figure 3;

-- Figure 4 shows a schematic, longitudinal cross section through the two dies of a press used to produce the molded article shown in Figures 2 and 3, in a condition where the dies are a certain distance away from each other and a flat textile product has been introduced into the gap between them;

-- Figure 5 shows a view similar to that of Figure 4, in which the press is in the closed position for the purpose of producing the molded article out of the flat textile product;

-- Figure 6 shows a perspective view of a semi-finished product produced in the press of Figure 5;

-- Figure 7 shows a perspective view of the finished product obtained from the semi-finished product of Figure 6, namely, of the molded article already shown in Figures 2 and 3;

-- Figures 8 and 9 show corresponding longitudinal cross

sections through alternative embodiments of a finished inventive molded article, where the cross-sectional line for Figure 9 is indicated by line IX-IX in Figure 10; and

-- Figure 10 shows a side view of the third exemplary embodiment shown in Figure 9, looking in the direction of the arrow X of Figure 9.

Figure 10 shows a longitudinal cross section of a part of a vehicle body 10, which is provided with a cup-like recess 13. A shell-shaped molded article 20, which consists of a flat textile product 30 according to Figure 4, is to be introduced into this recess 13. This flat textile product 30 can be a piece of nonwoven material or of needled felt and initially is in the form of a flat web. The nonwoven or needled felt material is treated with a binder. The shell-shaped molded article 20 has an opening 21, which is bounded by a side wall 22. With respect to the working position shown in Figure 1, the opening 21 is located at the outer end 25 of the molded article 20 and is provided there with a flange 24, which extends all the way around the edge. The bottom of the shell thus determines the inner end 26 of the molded article 20. In the inserted position of Figure 1, the edge flange 24 rests on the upper surface of the vehicle body 10, which surrounds the cup-shaped recess 13.

The bottom of the shell can come to rest on the bottom 16 of the cup-like recess 13.

The molded article 20 is provided with two parting lines 14, 15, which extend along two opposing flat areas of the shell wall 22. As Figure 1 shows, the parting lines 14, 15 proceed from the opening 21. This is also where the outer end 18 of the joint is located. In the present case, the parting lines 14, 15 extend over the entire depth 29 of the molded article 20, and the inner end 19 of the joint, as can be seen in Figure 1, is located in the area of the bottom 23. The parting lines 14, 15 also pass through the molded flange 24.

The parting lines 14, 15 divide the molded article 20 into two segments 11, 12, shown in Figure 6, which can be folded toward each other in the direction of the motion arrow 27 of Figure 6. The bending line 28, illustrated in dotted line in Figures 3 and 6, extends between the inner joint ends 19 of the two parting lines 14, 15. This bending line functions now as an axis around which the segments can be folded. Figure 6 shows the two molded segments 11, 12 in their folded-out position, indicated by the auxiliary lines 20.1, and the fold-out angle between them. Figure 7 shows the folded-in position of the two molded segments. The parting lines 14, 15 are closed in Figure

7. The folded-in position is illustrated in Figure 7 by the auxiliary lines 20.2.

The molded article 20 is produced in a special way, which is explained in greater detail on the basis of Figures 4 and 5. Here are shown the heatable or coolable upper and lower dies 31, 32 of a press, in which the male profile 33 for the one molded segment 11 and the female profile 34 for the other molded segment 12 are formed on and recessed into their respective dies in a position characterizing the previously mentioned folded-open position 20.1. Figure 4 shows the gap between the two dies 31, 32, moved toward each other. The previously mentioned flat textile product 30 is placed in the gap area 35, and then the two dies 31, 32 are pressed together. This is shown in Figure 5. The originally flat product is thus deep-drawn to the extent indicated by the arrows 36 and assumes the material form 30' for the two molded segments 11, 12, the flat textile product being molded into the final shape under the effect of pressure. The deep-drawing distance 36 is considerably smaller than the given shell depth 29 of the finished molded article 20 of Figure 1. The textile material 30' is therefore subjected to less stress than would be necessary if the desired shell depth 29 were to be produced according to the state of the art. As Figure 4 shows,

the thickness 37 of the layer can therefore be relatively small, and this means in turn that the input weight of the nonwoven material or needled felt 30 will be correspondingly reduced. The wall thickness 38 of the molded material 30' of Figure 5 is still sufficiently large, however, ever at its smallest point. After the flat textile product has been press-molded, the intermediate product shown in Figure 6 is obtained, namely, the molded segments 11, 12 in their folded-out position 20.1.

The desired molded article 20 is obtained by folding in the material 27 of the two molded segments 11, 12 toward each other as shown in Figure 6. The previously described folded-in position 10.2 of Figure 7 is thus obtained. The treated textile material 30' forms overlaps 40 in the area of the two parting lines 14, 15. This is illustrated in greater detail in Figure 3a. At the edge 43 of the one molded segment 11, which defines the parting line 14 here, there is a flange 41, which is raised beyond the outside surface of the shell wall 22. A recessed, flattened area 42 at the edge 44 of the adjacent segment 12 cooperates with the flange 41. In the folded-in position of Figure 3a, therefore, no sound bridges are formed in the area of the joints 14, 15 either. As previously mentioned, the parting lines 14, 15 also pass through the flange 24 extending around

the edge of the shell opening 21. To obtain a satisfactory overlap in the area of these edge flanges 24, the parting line of the part of the flange 24 belonging to the first molded segment 11 is set back from the longitudinal edge of the joint-side flange 41 by a distance designated 17, as Figure 6 illustrates.

Because the finished molded article 20 is inserted into the recess 13 of the vehicle body 10 according to Figure 1, this alone guarantees that the two molded segments 11, 12 will remain in the folded-in position 10.2. To support this, it would be possible to apply binders, e.g., adhesives, to the area of the overlaps 40 or of the abutting parting lines 14, 15. As can be derived from Figures 3 and 6, the flanges 41 for both parting lines 14, 15 are on the same molded segment 11. The same is also true for the flattened areas 42, both of which are located on the second molded segment 12. In the present case, the two parting lines 14, 15 are aligned with each other, as can be seen in Figure 3. In this case, the previously mentioned bending line 28 is very short. It would also be possible, of course, if necessary, to offset these parting lines 14, 15 from each other. In the latter case, the bending line 28 will then be longer and will run across the shell bottom 23 at an angle. The parting

lines 14, 15 do not need to be straight lines or to be perpendicular to the shell bottom 23; they can have any desired profile and can be at any angle to the shell bottom 23.

The inventive molded article can, if necessary, have other 3-dimensional forms, which can be easily produced by fabricating the molded segments 11, 12 in their folded-open position 20.1. A second exemplary embodiment is shown in Figure 8, where the same reference numbers as those used for the first exemplary embodiment are used again to name the corresponding parts. To differentiate the two sets of parts, however, the numbers of the second embodiment are given an apostrophe (′). There is no need to discuss anything but the differences.

In the case of the molded article 20′ of Figure 8, the bottom 23′ of the shell has a width 46, which is much larger than the width 47 of the associated opening 21 of the shell. The side shell walls 22′ extend at an angle, expanding toward the bottom 23′ of the shell.

Figures 9 and 10 show a third exemplary embodiment of a molded article 20′′ according to the invention. Here, too, it is necessary to discuss only the differences. The corresponding components are designated by the same reference numbers as those of the first exemplary embodiment, except that a double

apostrophe ('') is added to identify them.

In this case, too, the bottom 23'' of the shell has a width 48 which is greater than the width 49 of the opening 21'' of the shell. This differences in width is accomplished in the case of the molded article 20'' by providing one of the side walls 32'' of the shell with a bulged-out area 39. With a molded article 20'' of this type, it is possible to fill correspondingly profiled, bulged-out recesses 13 in the body 10 of the vehicle. Of course, such molded articles 20-20'' can also be used as containers, independently of the vehicle body 10.

In the case the molded article 20'' of Figures 9 and 10, there are again overlaps 40'' in the area of the parting lines 14'', 15''. These overlaps 40'' consist, in a similar manner, of flanges 41'' and flattened areas 42''. In the case of molded article 20'', the parting lines 14'' and 15'' run through the bulged-out area 39 and thus divide the shape into the analogous molded segments 11'', 12'', which can be folded toward each other. In this case, too, the parting lines 14'', 15'' run along the entire length of the side walls 22''. As a result, the bending line 28'', which functions as the folding axis, is located in the bottom 23'' of the shell and connects the two inner ends of the parting lines 14'', 15''.

List of Reference Numbers

10	vehicle body (Figure 1)
11	first molded segment of 20 (Figure 6)
11''	first molded segment of 20'' (Figures 9, 10)
12	second molded segment of 20 (Figure 6)
12''	second molded segment of 20' (Figures 8, 9)
13	cup-shaped recess in 10 (Figure 1)
14	first parting line in 20 (Figures 1-3)
14''	first parting line of 20'' (Figures 9, 10)
15	second parting line of 20 (Figures 1-3)
15''	second parting line of 20'' (Figures 9, 10)
16	bottom of cup 13
17	offset for 24 on 11 (Figure 6)
18	outer end of 14, 15 (Figure 1)
19	inner end of 14, 15 (Figure 1)
20	molded article (Figures 1-7)
20'	first alternative to 20 (Figure 8)
20''	second alternative to 20 (Figures 9, 10)
20.1	folded-out position of 11, 12 (Figure 6)
20.2	folded-in position of 11, 12 (Figure 7)
21	shell opening of 20
21'	shell opening of 20'

21'' shell opening of 20''

22 side shell wall of 20

22' side shell wall of 20'

22'' side shell wall of 20''

23 shell bottom of 20

23' shell bottom of 20'

23'' shell bottom of 20''

24 edge flange on 22 (Figure 1)

25 outer end of 20 (Figure 2)

26 inner end of 20 (Figure 2)

27 arrow of folding movement of 11, 12 (Figure 6)

28 bending line between 14, 15 (Figure 3)

28'' bending line between 14'', 15'' (Figure 10)

29 shell depth of 20 (Figure 1)

30 flat textile product, nonwoven (Figure 4)

30' molded material of 30 (Figure 5)

31 upper die of the press (Figures 4, 5)

32 bottom die of the press (Figures 4, 5)

33 male profile of 11, 12 (Figure 4)

34 female profile of 11, 12 (Figure 4)

35 gap between 31, 32 (Figure 4)

36 deep-drawing distance of 30 for 30' (Figure 5)

37 layer thickness of 30 (Figure 4)

38 minimum wall thickness of 30′ (Figure 5)

39 bulged-out area of 22′′ (Figure 9)

40 overlap of 22 (Figures 2, 3, 3a, 7)

40′′ overlap of 22′′ (Figure 10)

41 projecting flange on 22 for 11 (Figures 3, 6)

41′′ flange on 22′′ (Figures 9, 10)

42 recessed flattened area on 22 (Figures 3, 6)

42′′ recessed flattened area on 22′′ (Figures 9, 10)

43 edge of 11 at 14 (Figure 3a)

44 edge of 12 at 14 (Figure 3)

45 outer surface of 22 (Figure 3a)

46 width of 23′ (Figure 8)

47 open width of 21′ (Figure 8)

48 width of 23′′ (Figure 9)

49 open width of 21′′ (Figure 9)